



**Earned Value Management Tutorial
Module 4: Budgeting**

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Module 4: Budgeting

Welcome to Module 4. The objective of this module is to introduce you to Budgeting Concepts and Definitions.

The Topics that will be addressed in this Module include:

- Cost/Schedule Baselines
- WBS Levels: Control Accounts, Work Packages, Planning Packages
- Elements of an Earned Value Contract Baseline
- Proposed Cost and the Contract Budget Baseline
- Control Account Manager Roles and Responsibilities
- Review



The Budgeting Process

In the previous module, we defined Planning as making decisions with the following objectives:

- Define what will be performed (Statement of Work)
- Determine how the work will be structured and tracked (Work Breakdown Structure)
- Assign Responsibility for elements of work (Organizational Breakdown Structure)
- Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program

Now let's discuss Budgeting.



The Budgeting Process

The budgeting process establishes a means for developing and tracking the cost goals for all contractually authorized work.

One of the key criteria for establishing an earned value management system is that all major components of a project must be integrated and baselined. Major components of the earned value management system include scope, schedule and cost. The cost and schedule performance are measured against a baseline to help track the progress of the project.

But what is a baseline, and how do you establish one?

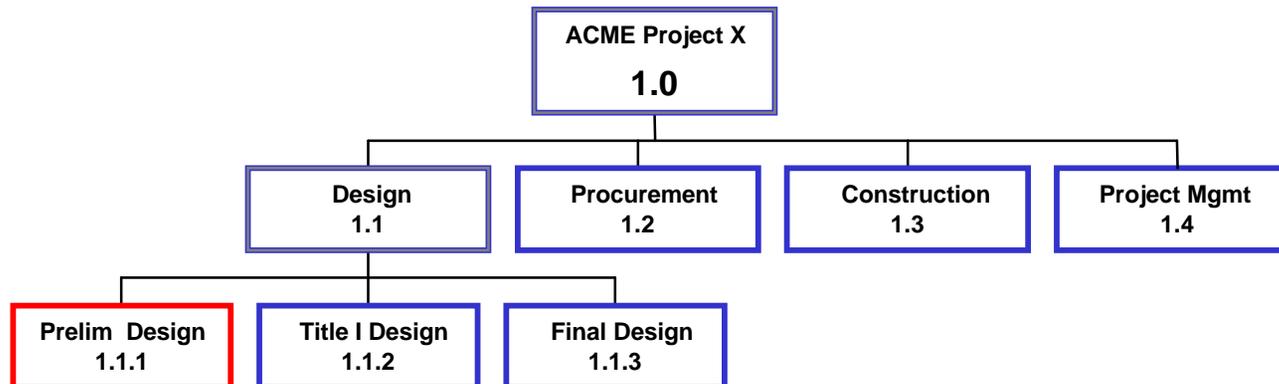
Let's review the steps required to establish a cost and schedule baseline on the next page.



Establish the Schedule Baseline

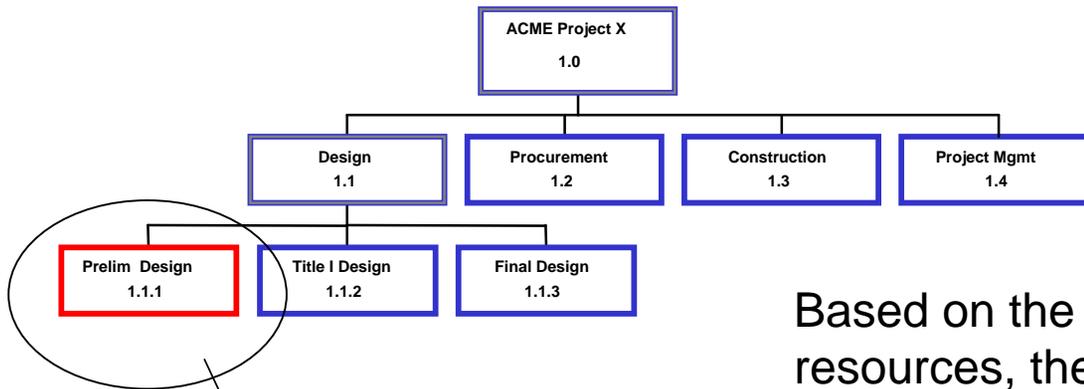
Recall the Work Breakdown Structure from Module 2, which defines a project's tasks, processes, responsible parties, etc. Establishing the WBS is the first step in defining the project and in establishing the baseline.

Acme Project Work Breakdown Structure





Establish the Schedule Baseline



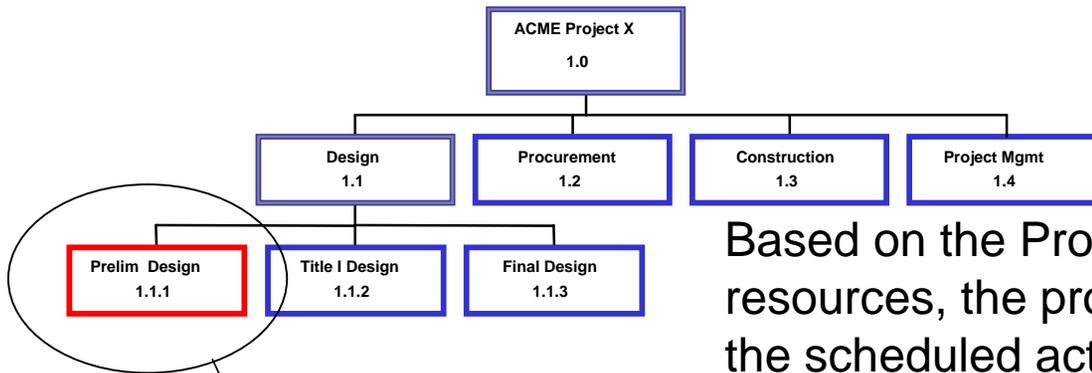
Based on the Project Scope and available resources, the work activities in the WBS are scheduled to establish the Schedule Baseline. This important step was covered in Module 3.

Schedule Baseline

Preliminary Design 1.1.1	Jan	Feb	Mar	Apr	May
1.1.1.1 Define Specifications & Req.	█				
1.1.1.2 Develop Preliminary Design		█			
1.1.1.3 Review Preliminary Design			█		
1.1.1.4 Incorporate Comments				█	
1.1.1.5 Preliminary Design Complete					█



Establish the Cost Baseline



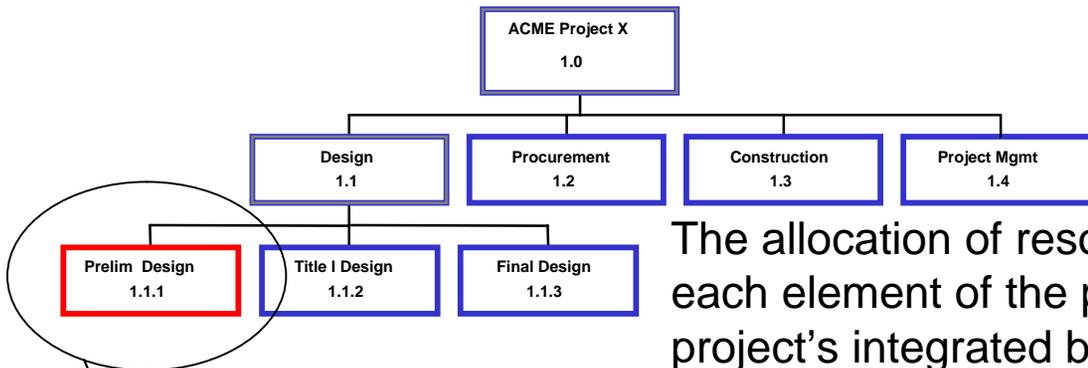
Based on the Project Scope and available resources, the project budget is allocated across the scheduled activities and across time. The time phased allocation of resources, establishes the Cost Baseline. Notice in the chart the time phased hours associated with each task.

Cost Baseline

Preliminary Design 1.1.1 Hours	Jan	Feb	Mar	Apr	May
1.1.1.1 Define Specifications & Req.	1,500	1,000			
1.1.1.2 Develop Preliminary Design		2,000	2,000		
1.1.1.3 Review Preliminary Design			500	500	
1.1.1.4 Incorporate Comments				320	320
1.1.1.5 Preliminary Design Complete					1,000



Integrated Scope, Schedule and Cost



The allocation of resources across the schedule for each element of the project's scope is what creates the project's integrated baseline. The scope, cost, and schedule must be fully integrated to be able to perform EVM. As the chart shows below, each task has an associated schedule and time phased cost.

Integrated Cost/Schedule Baseline

Preliminary Design 1.1.1 Hours	Jan	Feb	Mar	Apr	May
1.1.1.1 Define Specifications & Req.	1,500	1,000			
1.1.1.2 Develop Preliminary Design		2,000	2,000		
1.1.1.3 Review Preliminary Design			500	500	
1.1.1.4 Incorporate Comments				320	320
1.1.1.5 Preliminary Design Complete					1,000



Work Breakdown Structure Reporting Levels

Now let's discuss how the budgeting process and the cost/schedule integration is accomplished in an earned value environment.

The Work Breakdown Structure is the framework used to facilitate the requirement for integrating these major components. The Work Breakdown Structure is further broken down by Control Accounts, Work Packages, and Planning Packages.

Let's discuss these three key elements in more detail, starting with Control Accounts, on the next page.



Control Accounts

A Control Account is an assigned WBS Level used to monitor the cost and schedule performance of a significant element of the work. Control Accounts are also referred to as Cost Accounts. These terms are interchangeable, however, we will use the term Control Accounts.

A Control Account is a major management control point for:

- Cost Summarization
- Variance Analysis and Reporting
- Responsibility Assignment
- Scope Description
- Corrective Action Planning

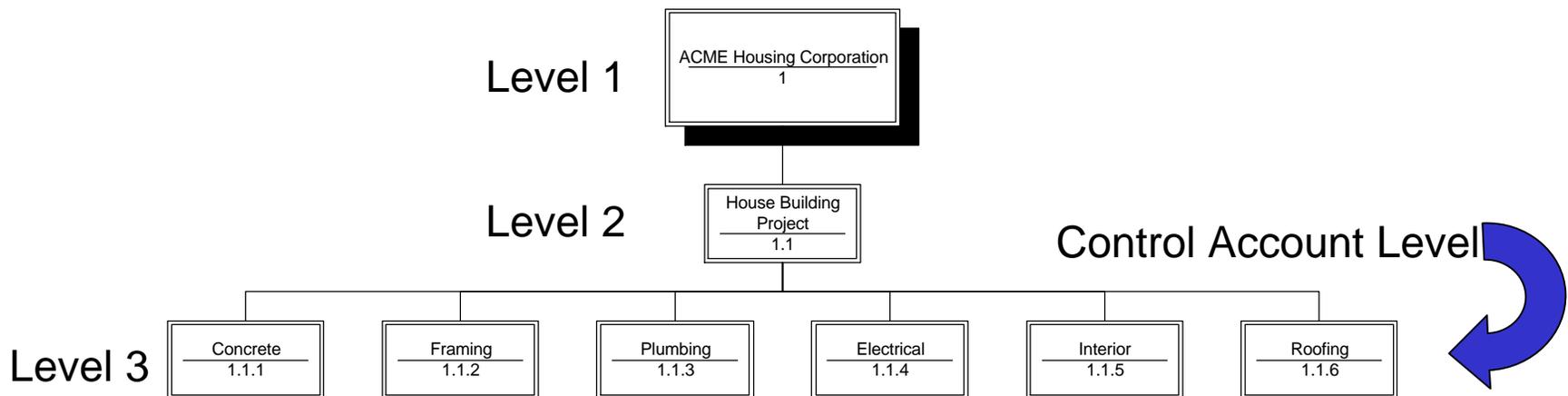
A Control Account Manager (CAM) is responsible for executing the Statement of Work associated with their assigned Control Account(s).

The illustration on the following page depicts the ACME House Project WBS down to the Control Account Level.



Control Accounts

For the ACME House project, it was determined that the performance measurements for the project will be taken at Level 3 (see graphic below). The project manager and the stakeholders must determine the level at which the performance measurement will be required.





Work Packages

The detail that builds up to the Control Account Level is contained in Work Packages and Planning Packages. Take a moment now to review Work Packages.

Work Packages (WP) contain a discrete segment of work below the Control Account level that is defined by

- a description or brief work statement
- starting and ending dates
- completion milestone
- work-in-process measure
- time-phased budget expressed in direct labor (hours and/or dollars), material, other direct costs and subcontract dollars

It is important that the duration of a Work Package be a relatively short span of time (normally, but not limited to, six months or less).

Now let's take a look at Planning Packages on the next page.



Planning Packages

Planning Packages reflect a future segment of work within a Control Account that is not yet broken down into detailed work packages. A planning package has a firm budget, estimated start and complete dates, and Statement of Work.

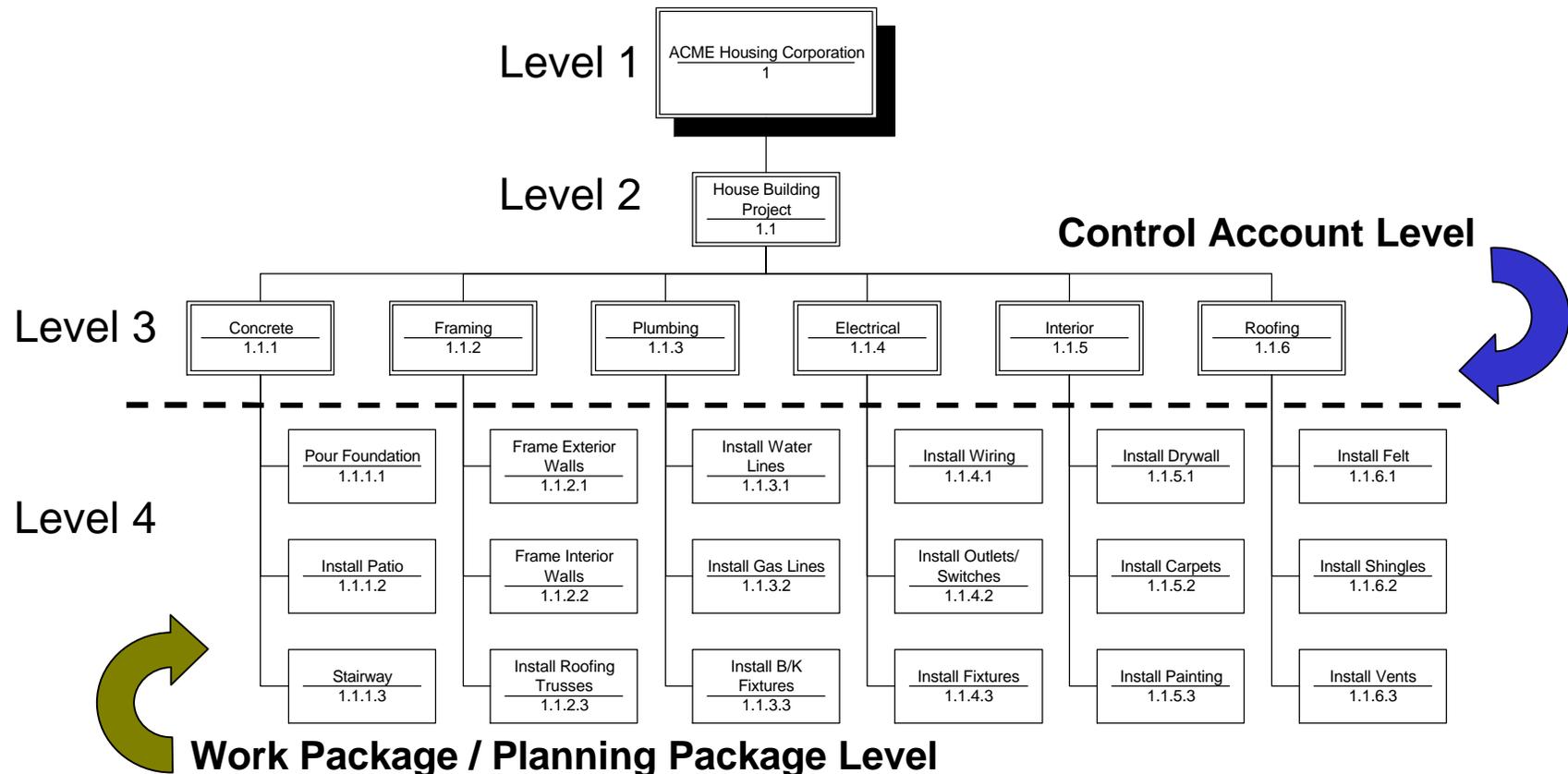
As work becomes more clearly defined, Planning Packages are converted into Work Packages, with the following constraints. These constraints ensure the initial budget is used appropriately:

- All planning packages are converted into work packages as requirements are defined, and at a minimum, are scheduled to start at least one month beyond the current reporting period
- Conversion of planning packages to work packages is reviewed by the Team Leader and documented on a Revision Request (RR)
- Any conversion involving a change to the schedule or budget of the control account must be accompanied by an RR



Work Packages/Planning Packages

Now that you are familiar with work packages and planning packages, take some time to examine how they appear in the WBS. For the ACME House project, the Work Packages and Planning Packages will be at Level 4 of the WBS. This is the level at which detailed budgets will be developed, stasured, and then summarized at the Control Account level for reporting.





Review

At this point, you should have a comfortable understanding of the following:

The budgeting process establishes a means for documenting and tracking the cost goals for all contractually authorized work.

The baseline is what cost and schedule performance is measured against.

A Control Account is an assigned WBS Level used to monitor the cost and schedule performance of a significant element of the work.

Detail below the Control Account Level is contained in Work Packages and Planning Packages.

If you are unsure about any of these concepts, please go back and review, otherwise let's move on to discuss the key elements used to develop, baseline, and manage an earned value project or contract.

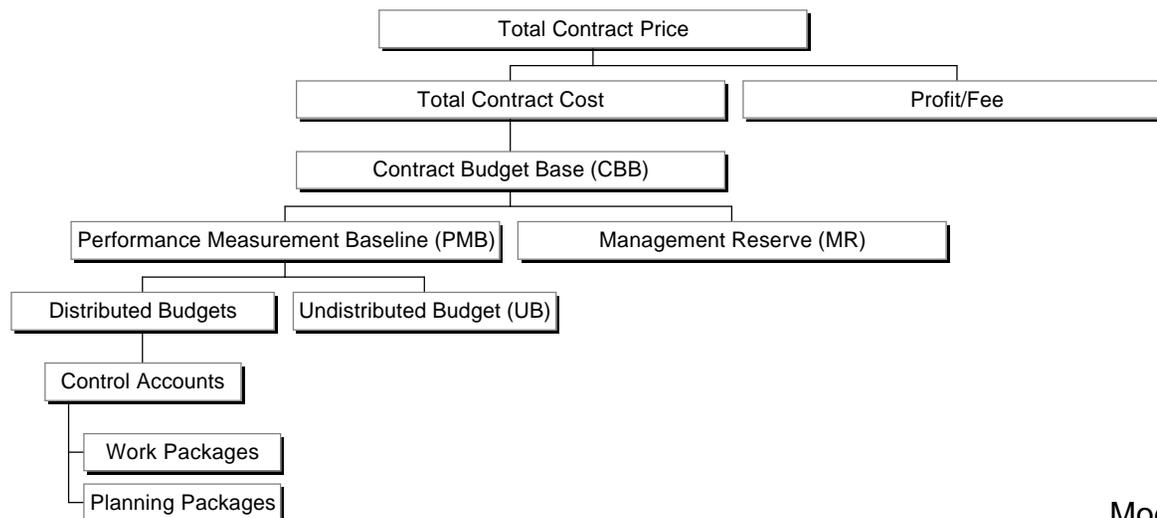


Elements of a Contract Baseline

The contract baseline is comprised of eight key elements:

- Total Contract Price
- Total Contract Cost
- Profit / Fee
- Contract Budget Base (CBB)
- Performance Measurement Baseline (PMB)
- Management Reserve (MR)
- Distributed Budgets
- Undistributed Budgets (UB)

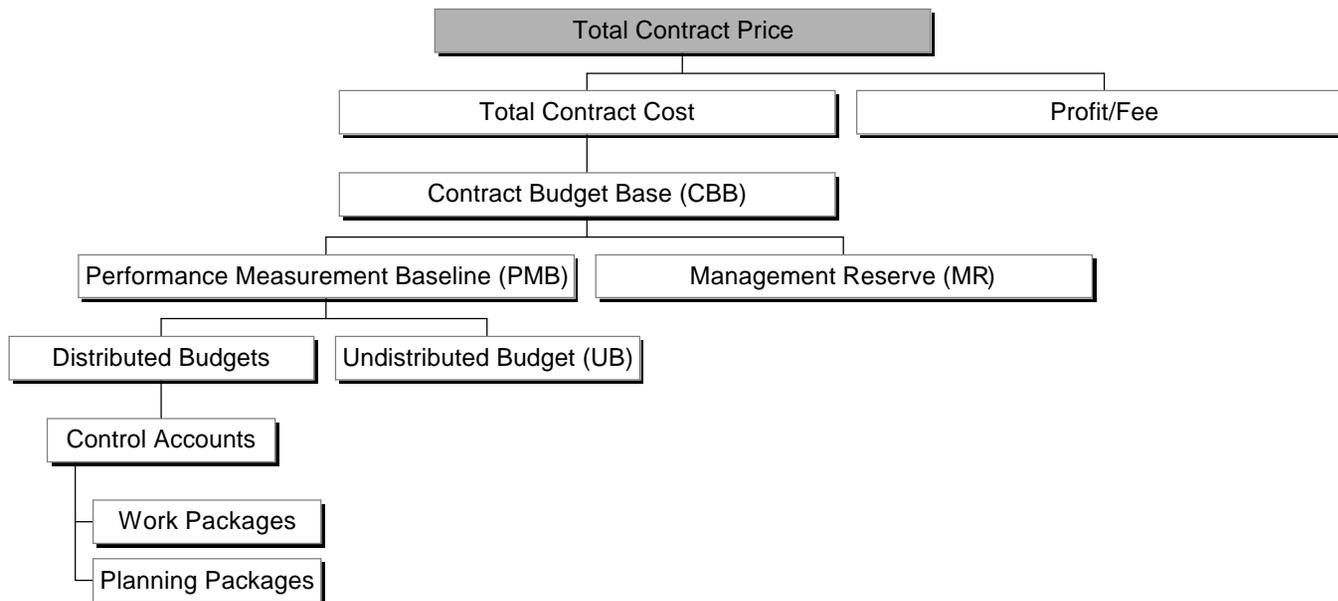
The relationship between these eight elements is depicted below. Each element is defined on the following pages and is illustrated using the ACME House Building Project.





Total Contract Price

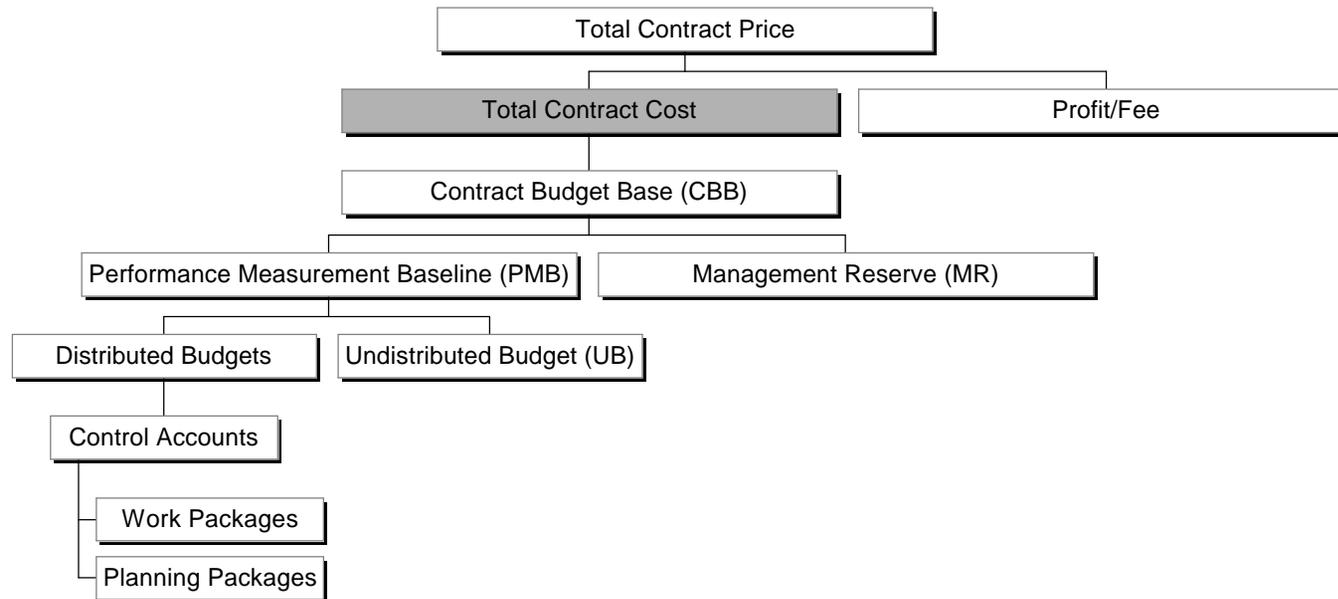
Total Contract Price is the total negotiated contract cost plus profit/fee.





Total Contract Cost

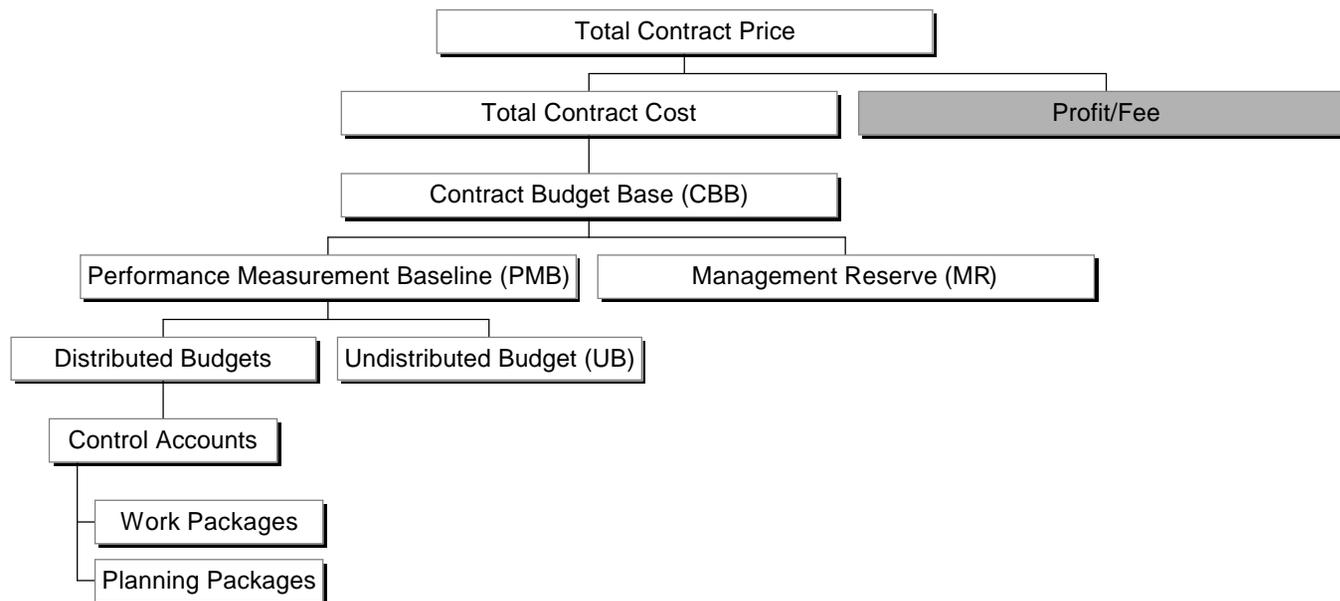
Total Contract Cost is the total negotiated contract cost without profit/fee.





Profit/Fee

Profit/Fee is the estimated profit or fee realized by executing the contract or project. Profit/Fee is not part of the Contract Budget Base (CBB), as defined on the next page.

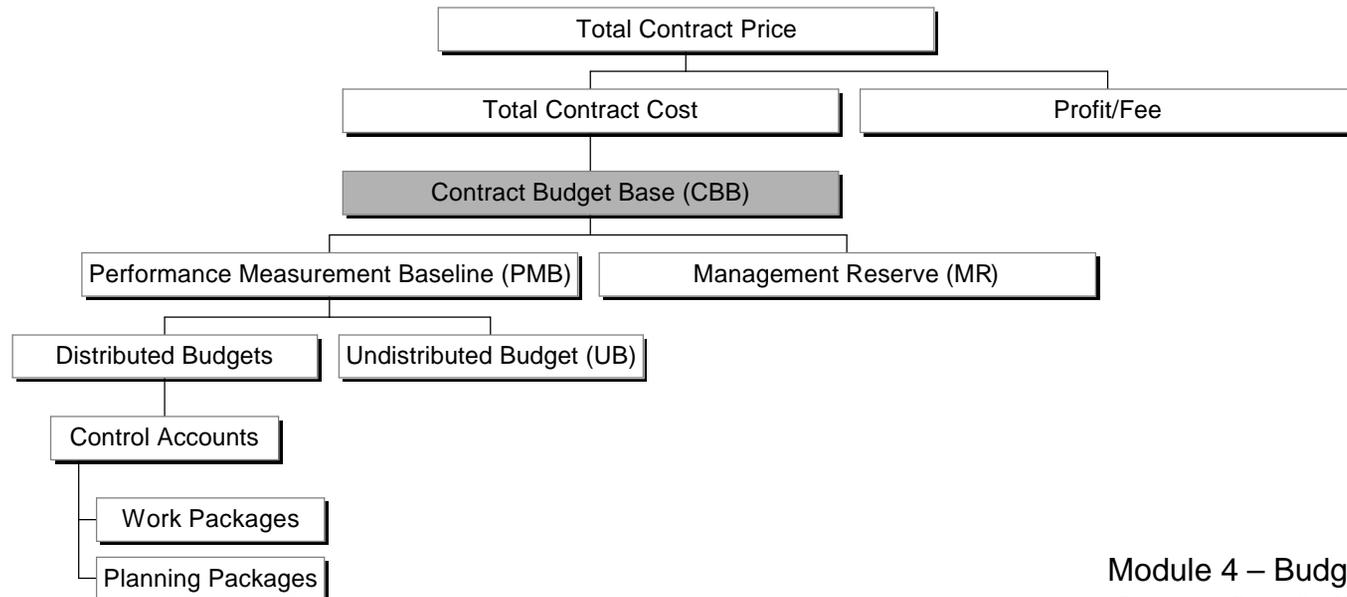




Contract Budget Base

The Contract Budget Base (CBB) represents the total budget for all authorized contractual work, minus Profit/Fee. The CBB can only be modified when duly authorized changes to the contract are received. CBB is always calculated as follows:

$$\text{Current negotiated contract cost} + \text{Estimated cost of additional authorized unpriced work (yet to be negotiated)} = \text{CBB}$$





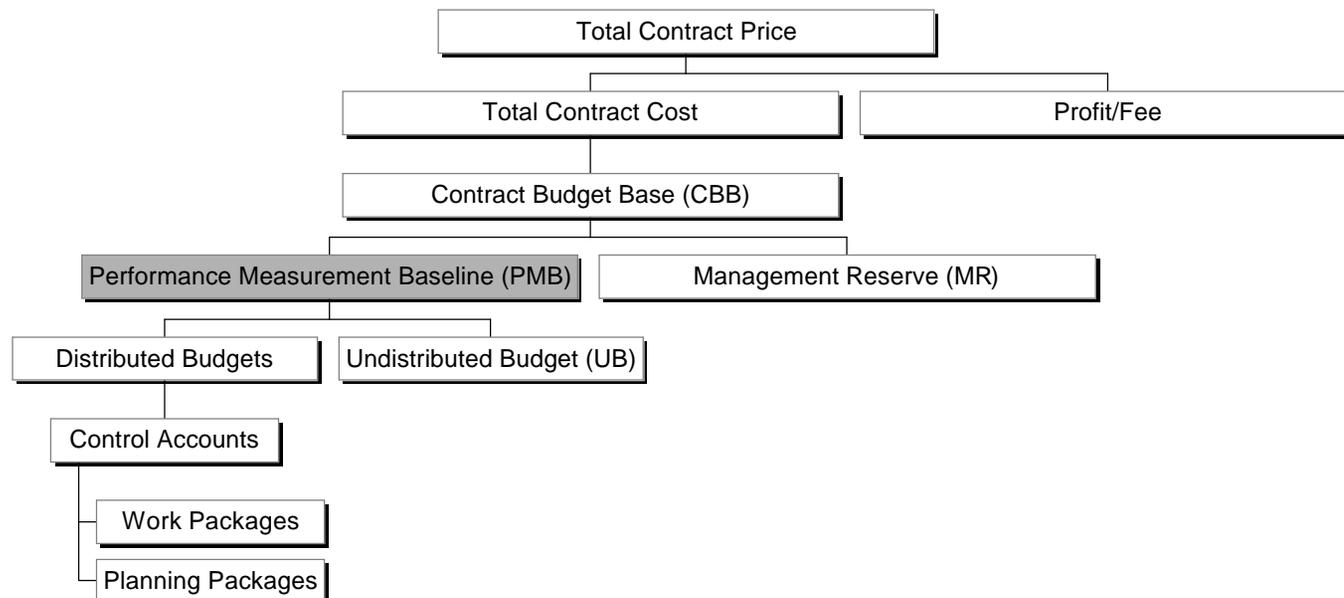
Performance Measurement Baseline (PMB)

The Performance Measurement Baseline (PMB) is the time-phased budget plan against which contract performance is measured. It includes all allocated or Distributed Budgets plus the Undistributed Budget. PMB does not include Management Reserve.

PMB = Sum of Control Accounts

PMB = Distributed Budgets + Undistributed Budgets

PMB = Contract Base Budget – Management Reserve

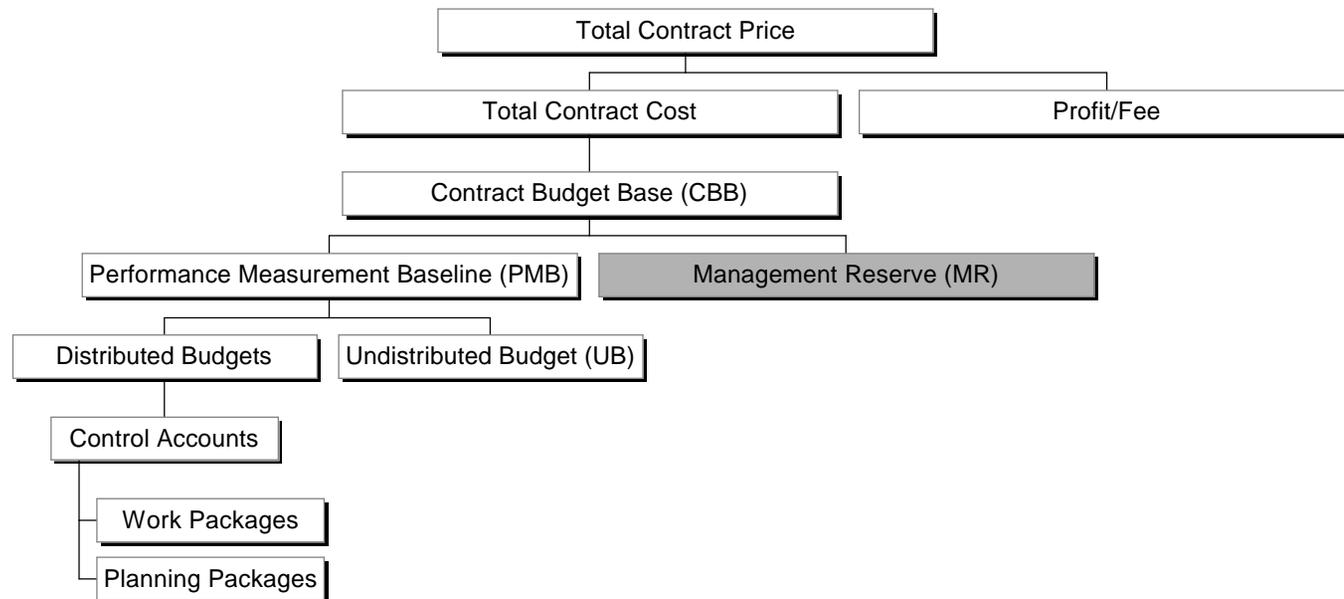




Management Reserve

Once the CBB is established, the Program Manager establishes a Management Reserve (MR) prior to distributing budgets to the performing organizations. The purpose of MR is to have a budget for the Program Manager to allocate for unforeseen problems.

MR is not part of the Performance Measurement Baseline because it is held at the program level only. Transactions into and out of MR are approved by the Program Manager. The documentation supporting all MR transactions is maintained and reported by Program Control.



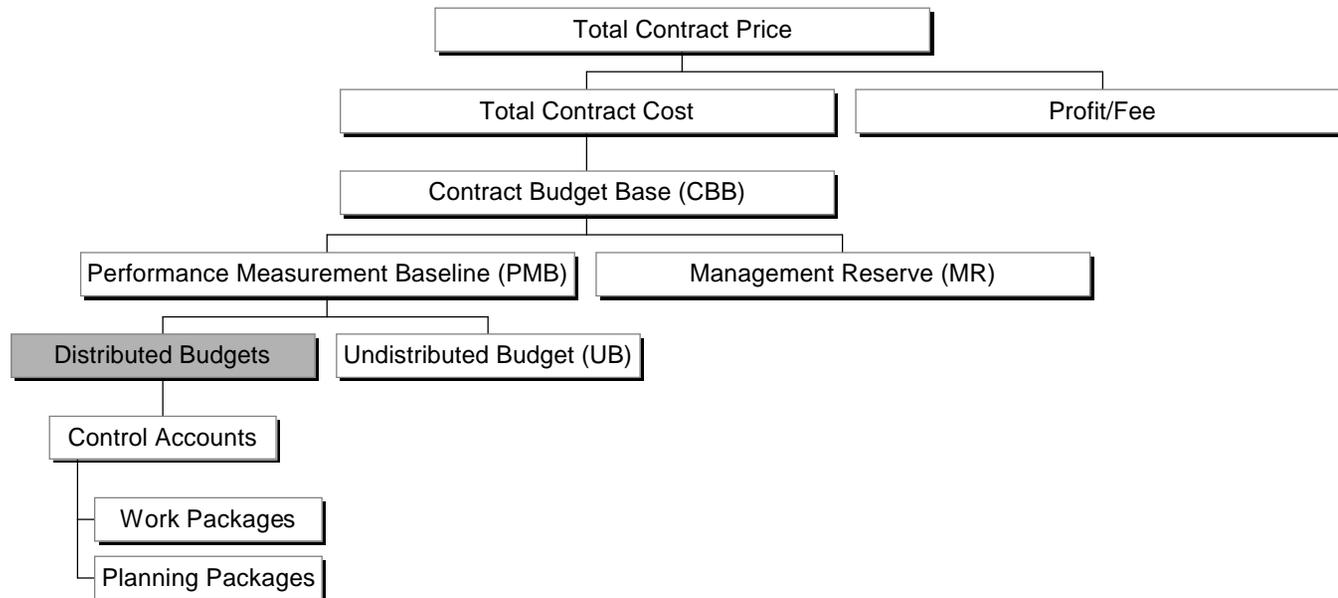


Distributed Budgets

Distributed Budgets reflect the contractually authorized efforts allocated to the WBS elements.

Distributed Budgets include budgets assigned to control accounts during baseline establishment as well as work packages and planning packages.

Distributed Budgets = Budgets assigned to Control Accounts

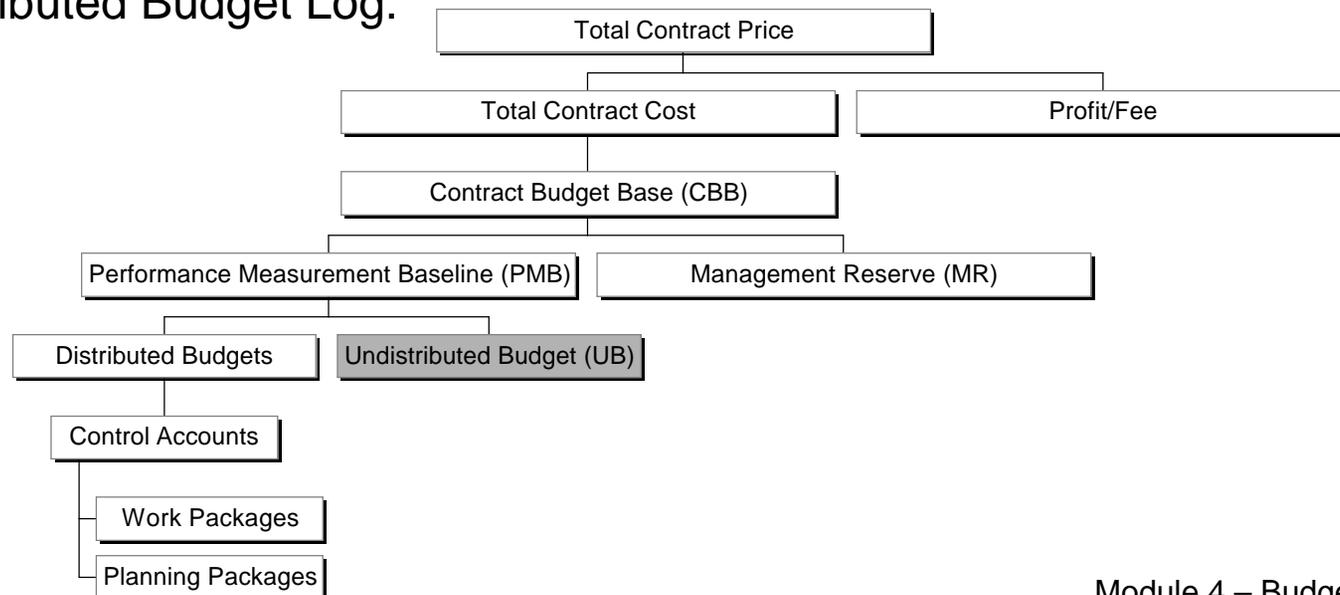




Undistributed Budget

Undistributed budget (UB) applies to contractually authorized efforts not yet allocated to WBS elements. The UB consists of a budget for authorized changes for which there has not been adequate time to plan the change at the control account level. Undistributed budget is an element of the Performance Measurement Baseline, but it is not time-phased.

Every effort should be taken to distribute budgets in a timely manner and to minimize undistributed budgets. Undistributed budgets are controlled by the Program Manager, and all changes must be documented using an Undistributed Budget Log.





Proposed Costs and the Contract Budget Base Relationship

To better understand the key elements of the Contract Budget Base, let's walk through the Proposal Development, Negotiations, and Contract Award Phases. To begin, first ensure you understand the relationship between the proposed cost and the established Contract Budget Base.

Program Funding, the negotiated and/or authorized amount, is based on the estimates developed during the proposal preparation phase. These estimates can be modified during the contract negotiation phase. The Program Funding amount is used to establish the Contract Budget Baseline (CBB).

A proposed cost estimate and a Contract Budget Base are developed in the same manner. The resources required to complete each defined element of work are developed in terms of hours. These hours are converted to Labor Dollars by applying Direct Labor Rates and Indirect Burdens (Direct and Indirect Costs are discussed on the following page). Costs of purchased materials and subcontracts (and applicable acquisition overhead rates) as well as Other Direct Costs (ODC) are also generated and included in the proposed amount.



Direct and Indirect Cost Accounting

As mentioned on the previous page, costs include direct and indirect charges.

Direct Costs – Costs applicable to, and identified specifically with, the program contract Statement of Work.

Examples of Direct Costs: Labor, Travel, Material, Subcontractor Charges

Indirect Costs – Charges that cannot be consistently or economically identified against a specific contract. These are typically calculated by applying rates and factors to the cost base.

Example of Indirect Costs: Fringe Benefits, Overhead, Material Handling, General & Administrative, Cost of Money.



Sample Indirect Rate Application

Here is an example of indirect rates applied to prime dollars or direct costs. Overhead costs are applied to prime dollars to derive the Total Cost. The application of indirect rates and factors is based on a company's accounting policies and procedures.

		<u>Design Engineering Task</u>		
		Design Engineer Hours	1,000	} Direct Costs
		Design Engineer Rate/Hour	\$ 40.00	
		Prime Dollars	\$ 40,000.00	
Indirect Cost	}	Overhead Rate	100%	
		Overhead Dollars	\$ 40,000.00	
		Total Burdened Dollars	\$ 80,000.00	
		G&A Rate	10%	
		G&A Dollars	\$ 8,000.00	
		Sub-Total	\$ 88,000.00	
		COM Rate	0.05%	
		COM Dollars	\$ 44.00	
		Total Cost	\$ 88,044.00	
		Fee Rate	10%	
Fee Dollars	\$ 8,800.00			
		Total Price	\$ 96,844.00	



ACME House Cost Proposal Development

By now you should be familiar with the difference in types of costs, but how exactly do you go about determining costs in a project? Take some time to see how to develop a proposed cost using the ACME House Building project.

So far in the ACME House Building project, we have:

- Defined what will be performed (Statement of Work)
- Determined how will it be tracked (Work Breakdown Structure)

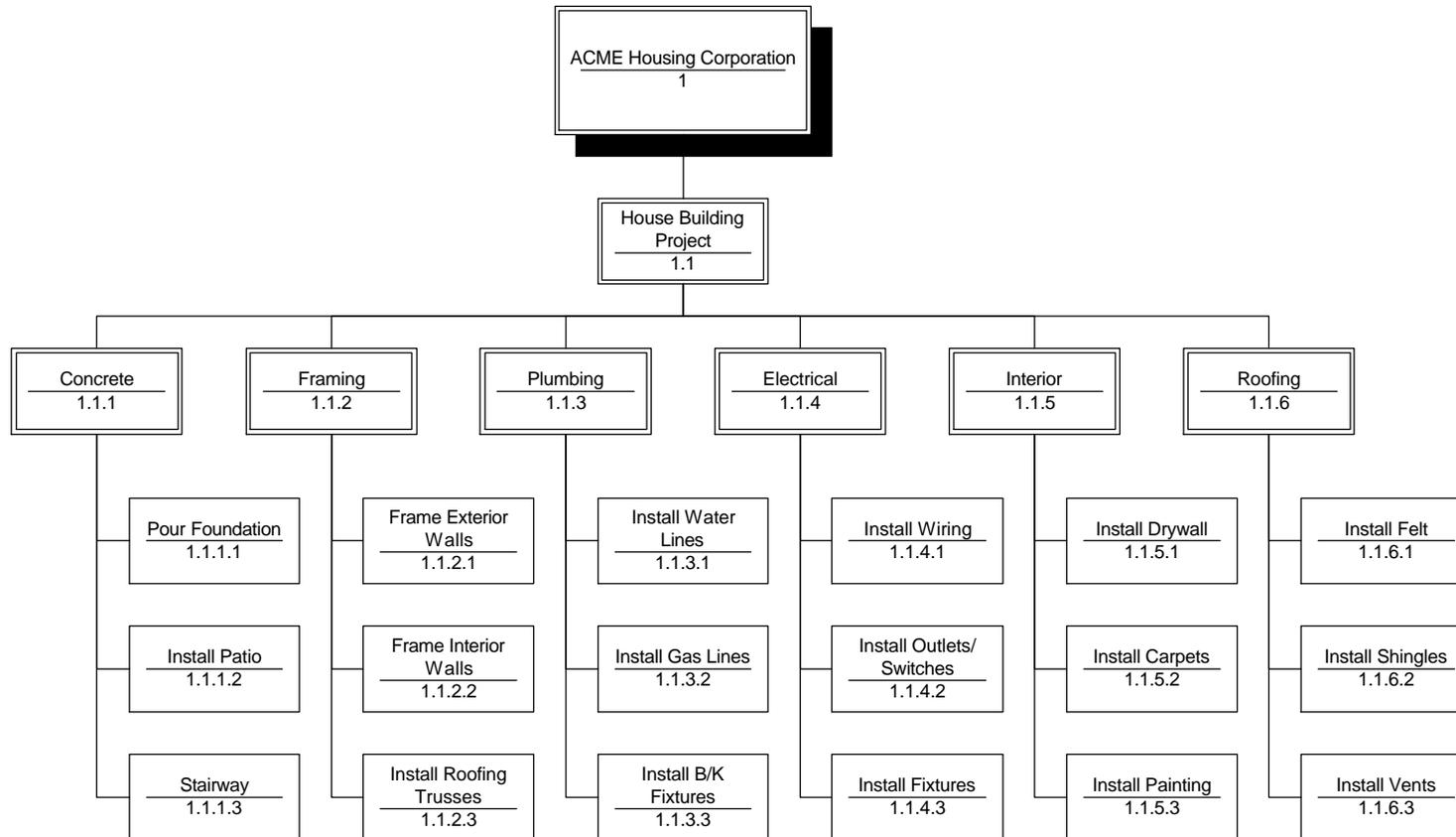
Now we have to:

- Determine the Proposed Total Cost and Price
- Assign Labor, Material, ODC, and Subcontractor Resources to the Work Elements.
- Apply Burdens and Fee to derive the Total Cost and Price.



ACME House Cost Proposal Development

To start, we need our ACME House Work Breakdown Structure as shown here.



This insures that we develop cost for only approved project scope.



ACME House Cost Proposal Development

Next, we must develop the Proposal Price. Below is an example of how we developed the Price for the WBS 1.1.1.2 to Install Patio.

We assigned resources to this task, and based on the Labor Hours, Material, and ODC Dollars, burdened by all the indirect rates, a Total Price of \$11,574 has been estimated to complete this task.

This process is used to price each WBS element. On the next page is the completed price for the ACME House.

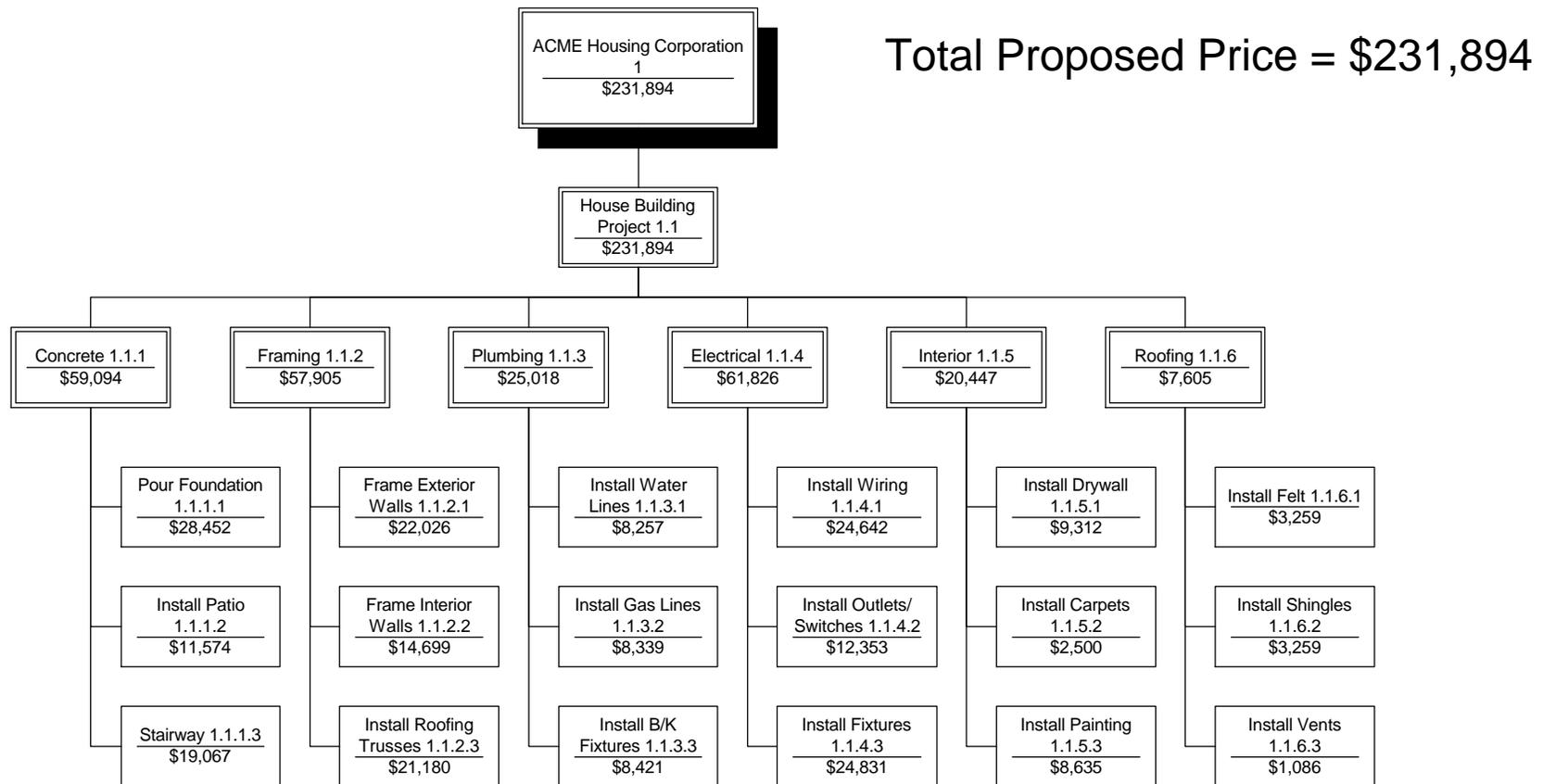
WBS 1.1.1.2 Install Patio

RES CODE	Hours	Rate/Hour	Prime	Overhead	G&A	COM	Fee	Total Price
Carpenter	40	\$ 25.00	\$ 1,000	\$ 1,666	\$ 422	\$ 2	\$ 618	\$ 3,707
Drywall	40	\$ 15.00	\$ 600	\$ 1,000	\$ 253	\$ 1	\$ 371	\$ 2,224
ELEC	4	\$ 40.00	\$ 160	\$ 267	\$ 67	\$ 0	\$ 99	\$ 593
ENGE	20	\$ 30.36	\$ 607	\$ 825	\$ 226	\$ 1	\$ 332	\$ 1,991
Material	0		\$ 2,000	\$ 109	\$ -	\$ 1	\$ 422	\$ 2,531
Other	0		\$ 500	\$ 27	\$ -	\$ 0	\$ -	\$ 527
Total	104		\$ 4,867	\$ 3,894	\$ 968	\$ 5	\$ 1,840	\$ 11,574



ACME House Cost Proposal Development

The proposed resources for the entire project have been priced as described on the previous page. The following chart reflects the Total Price for each WBS of the ACME Housing Building project.





ACME House Cost Proposal Negotiations

Now let's review the proposed price and complete the negotiations.

The proposed price is \$231,894; however, the buyer of the ACME house can only afford to pay \$220,000. The ACME house builder has agreed to build the ACME house for \$219,999, but some revisions had to be made to the plans to utilize less expensive materials.

The following summary reflects the negotiated cost and price to build the ACME House.

Negotiated ACME House Cost and Price

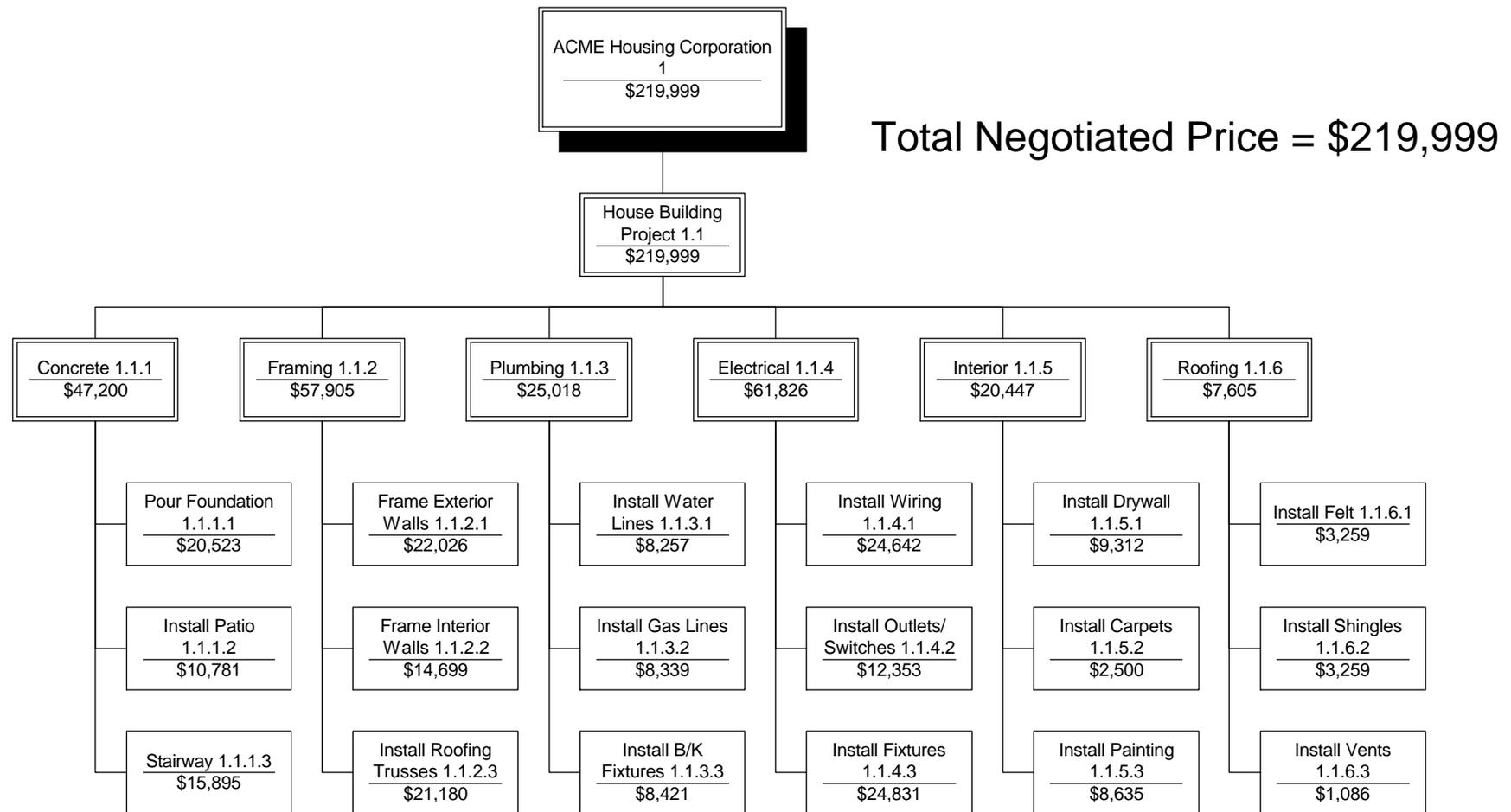
Total Cost	Fee	Total Price
\$183,852	\$36,147	\$219,999

On the next page, let's look at the Total Price by WBS.



ACME House Cost Proposal Negotiations

The following summary reflects the negotiated price by WBS to build the ACME House.



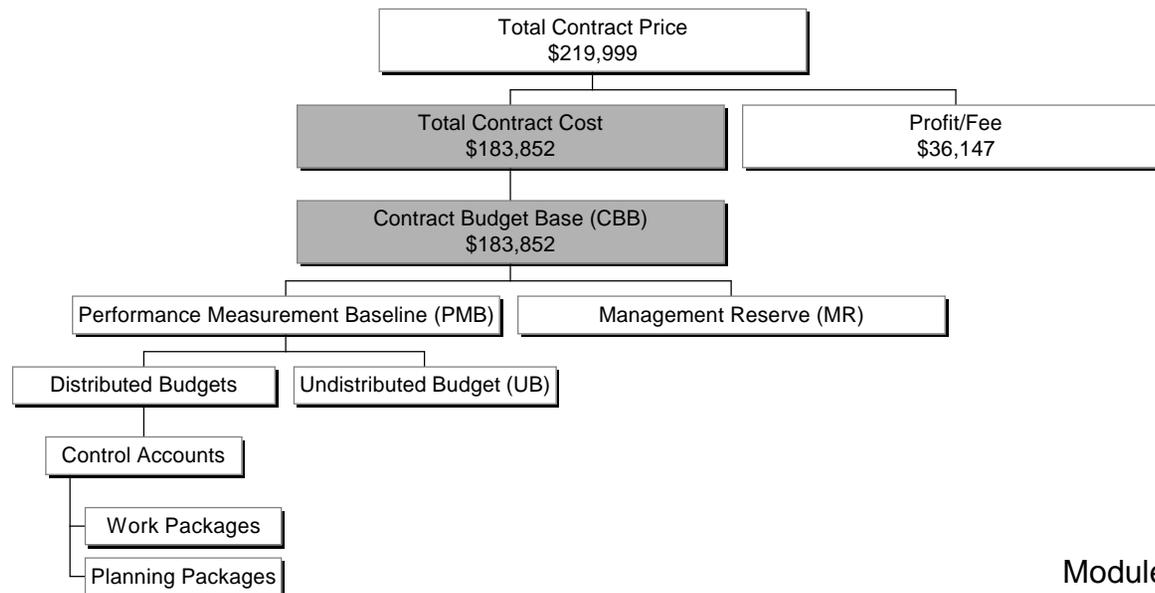


The Budgeting Process

Now that we have a negotiated contract, we can establish the Contract Budget Base.

The Awarded Amount to the Builder is \$219,999. This includes Profit/Fee.

The Negotiated Total Cost, without Profit/Fee, for the ACME House equals \$183,852. This will be the basis for developing the Contract Budget Baseline (CBB). Again, remember that this amount is exclusive of Fee.



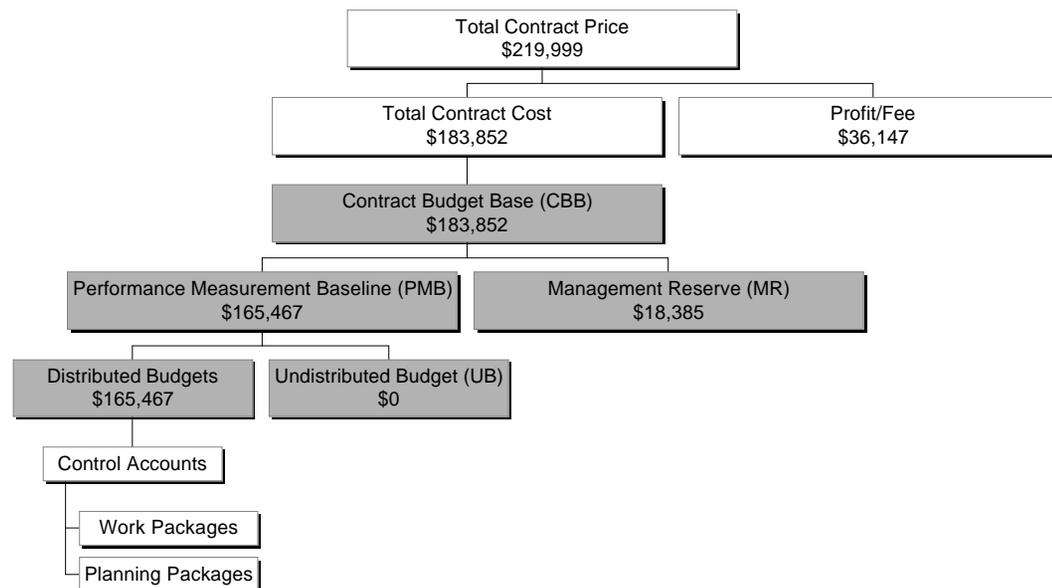


The Budgeting Process

After the Contract Budget Base has been established, the Management Reserve is established by the Program Manager.

In the case of the ACME House, the Program Manager has decided to establish a Management Reserve amount equal to 10% of the Contract Budget Base. This equates to \$18,385. The Performance Measurement Baseline, which equals the CBB – MR, will be established at \$165,467.

All of the PMB will be distributed, therefore Distributed Budgets will equal \$165,467, and Undistributed Budget will remain zero.

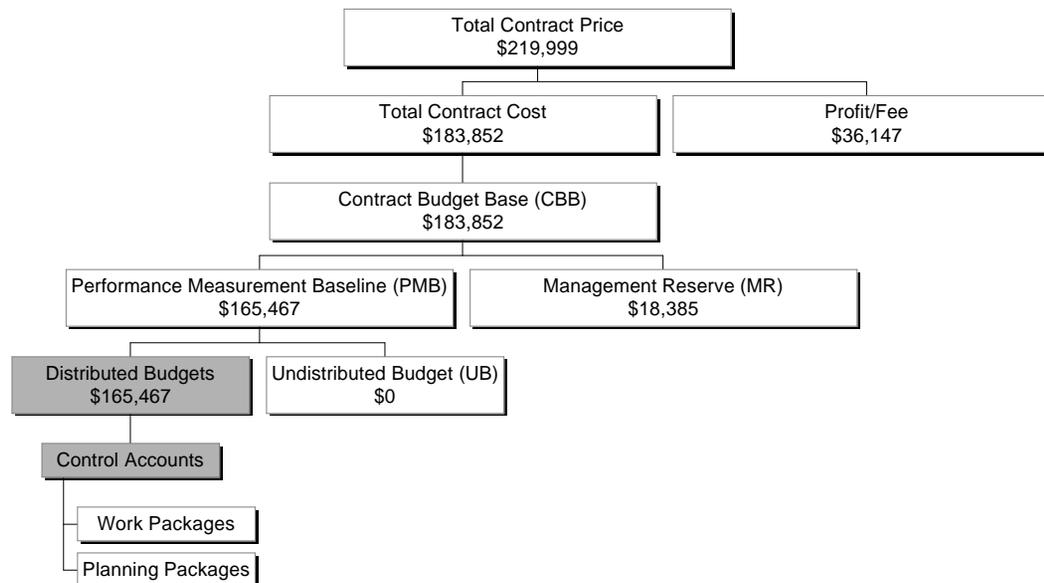




The Budgeting Process

Now that the Management Reserve has been established by the Program Manager, target budgets are developed and distributed to the Control Account Managers.

Establishing the target budgets will often be accomplished through a joint effort by the Program Manager, Team Leaders, and the Control Account Managers.





The Budgeting Process

In developing target budgets, applicable proposal information is relied upon heavily. The proposal information is modified to reflect negotiated changes and to accommodate establishment of MR.

For example, remember the ACME House Proposal? Control Account 1.1.1 Concrete, had a proposed Total Price of \$59,094, however, based on final contract negotiations, the negotiated price was \$47,200. The negotiated cost, without Profit Fee was \$39,424.

The following table summarizes the proposed vs. negotiated price for the Concrete effort. Remember, in establishing target budgets, Profit/Fee is not included.

Control Account 1.1.1 Concrete			
	<u>Total Dollars</u>	<u>Profit/Fee</u>	<u>Total Price</u>
Proposed	\$49,337	\$9,757	\$59,094
Negotiated	\$39,424	\$7,776	\$47,200



The Budgeting Process

The Program Manager has decided to establish a Management Reserve (MR) amount equal to 10% of the negotiated dollars. Once again, remember in establishing target budgets Profit/Fee and Management Reserve are not included.

The target budget released to the Control Account Manager for 1.1.1 Concrete is \$35,482 ($\$39,424 - \$3,942 = \$35,482$).

Control Account 1.1.1 Concrete

	<u>Total Dollars</u>
Negotiated	\$39,424
MR (10%)	-\$3,942
Target Budget	\$35,482



The Budgeting Process

When detailed planning reveals the target budget established for the control account is unrealistic (too high or low), the CAM, Team Leader and Program Manager participate jointly to determine appropriate adjustments. In some cases, this may require the use of MR.

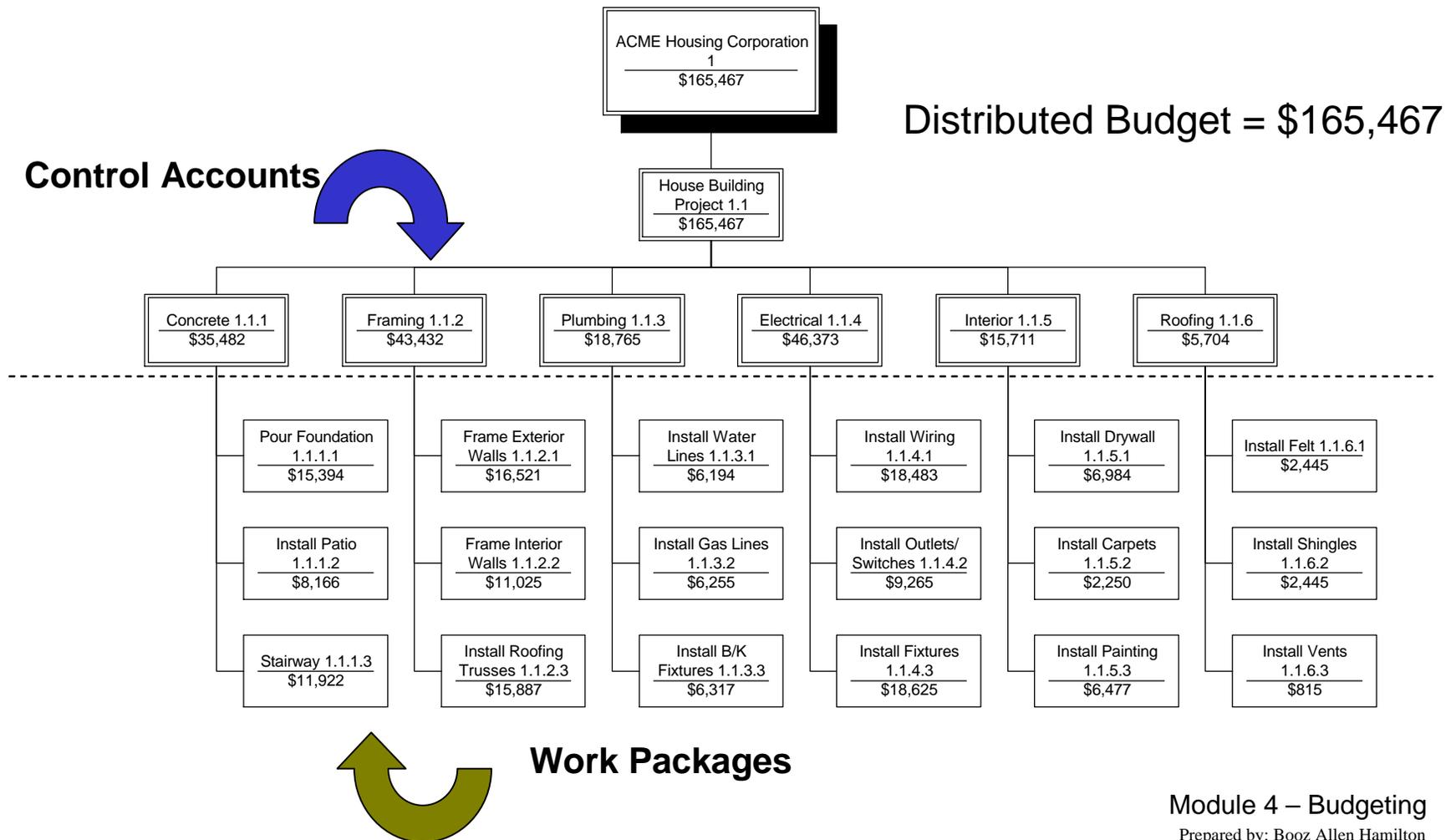
In the case of the Concrete Control Account, the Control Account Manager has accepted the budget of \$35,482.

Once the budgets have been allocated to the Control Accounts, the Control Account budgets are further subdivided into work packages and planning packages.



The Budgeting Process

Here's the distributed budget for the entire ACME WBS. Remember, this does not include Profit/Fee, or Management Reserve.





The Budgeting Process

Time phased budgets are prepared for each work package and planning package. Each work package and planning package contains a budget divided into time increments (typically monthly) by elements of cost, such as direct labor, material, subcontract, and other direct cost (ODC).

During the phasing process, Management ensures that requirements will be met, work sequences are logical, and resources are available to execute the plan.

The development of detail planning for the control account and ultimate approval of the budget, schedule, and associated Work Authorization Document (WAD) is accomplished through an iterative process.

A Work Authorization Document (WAD) authorizes and documents the work scope, schedule and budget to organizations supporting the project. No work is to proceed without a proper WAD.



The Budget Process

The Control Account Manager (CAM) uses work packages and planning packages to divide the control account into specific manageable and measurable units of work for the purpose of developing plans and determining progress.

Each work package and planning package is sequenced in a manner that provides logical support for the program schedule. The CAM assigns each work and/or planning package a budget value in hours and/or dollars.

The sum of the work packages and planning package budgets are equal to the total budget assigned to the CAM on the work authorization form. The total budget for the control account is time-phased in hours and dollars.



Baseline Documentation

Summaries of schedules and budgets at the work package level are integrated using a Control Account Plan (CAP). A CAP is a low level detail plan prepared by the CAM showing time phased planning of tasks and their associated budget for a Control Account. The CAP also provides brief work package and milestone descriptions that enable the CAM to clarify and differentiate the unique content of each work package.

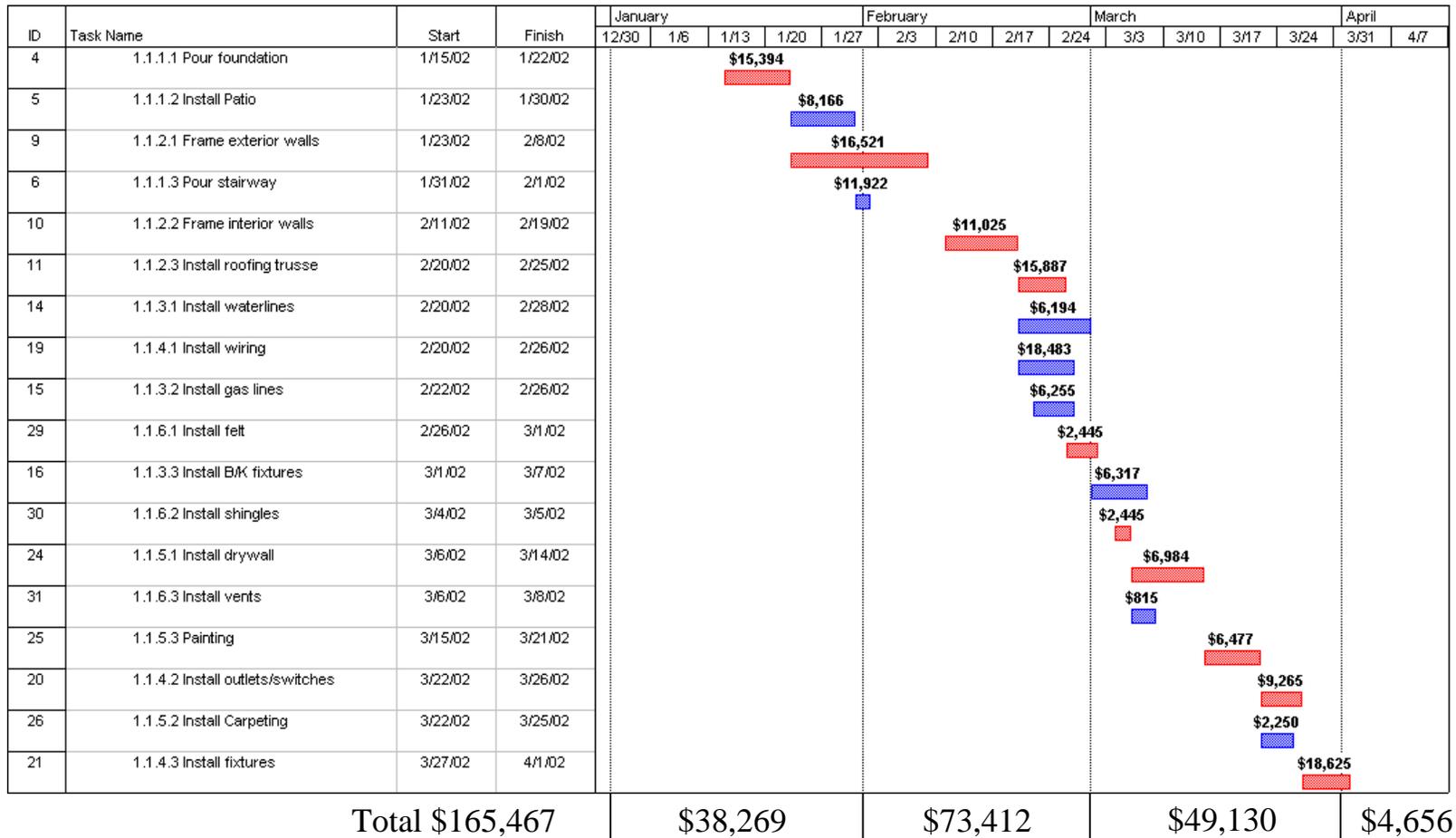
The CAM and Program Control develop the cost and schedule database by using the control account planning documentation and other data. A series of checks and balances are performed to ensure the data is consistent. Upon completion of the baseline development, reports displaying the planning data as it appears in the system are reviewed and verified for accuracy.

The baselining process is complete when all Work Authorization Document (WADs) have been issued and accepted, and all CAPS have been developed and equal the WAD budget amounts.



Schedule and Cost Baseline

Below is the time-phased budget for the ACME House Building Project. This profile represents the cost and schedule baseline in Total Dollars.





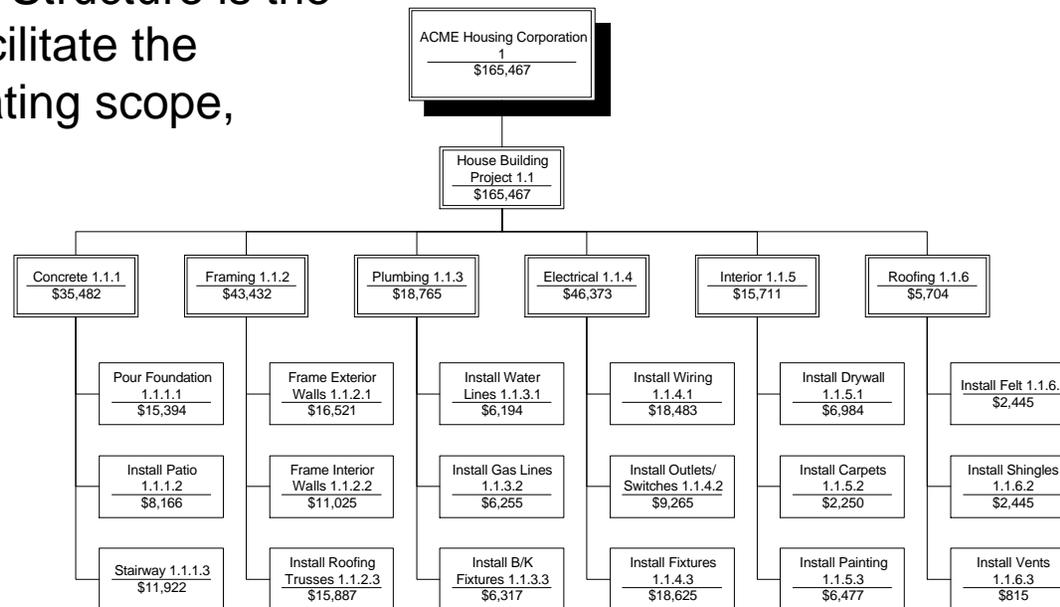
Review of Module 4: Budgeting

Many new terms and concepts were presented in this module. Let's summarize what was covered.

The budgeting process establishes a means for developing and tracking the cost goals for all contractually authorized work.

One of the key criteria for establishing an earned value management system is that the scope, schedule and cost must be integrated and baselined. The baseline is what cost and schedule performance is measured against

The Work Breakdown Structure is the framework used to facilitate the requirement of integrating scope, schedule, and cost.



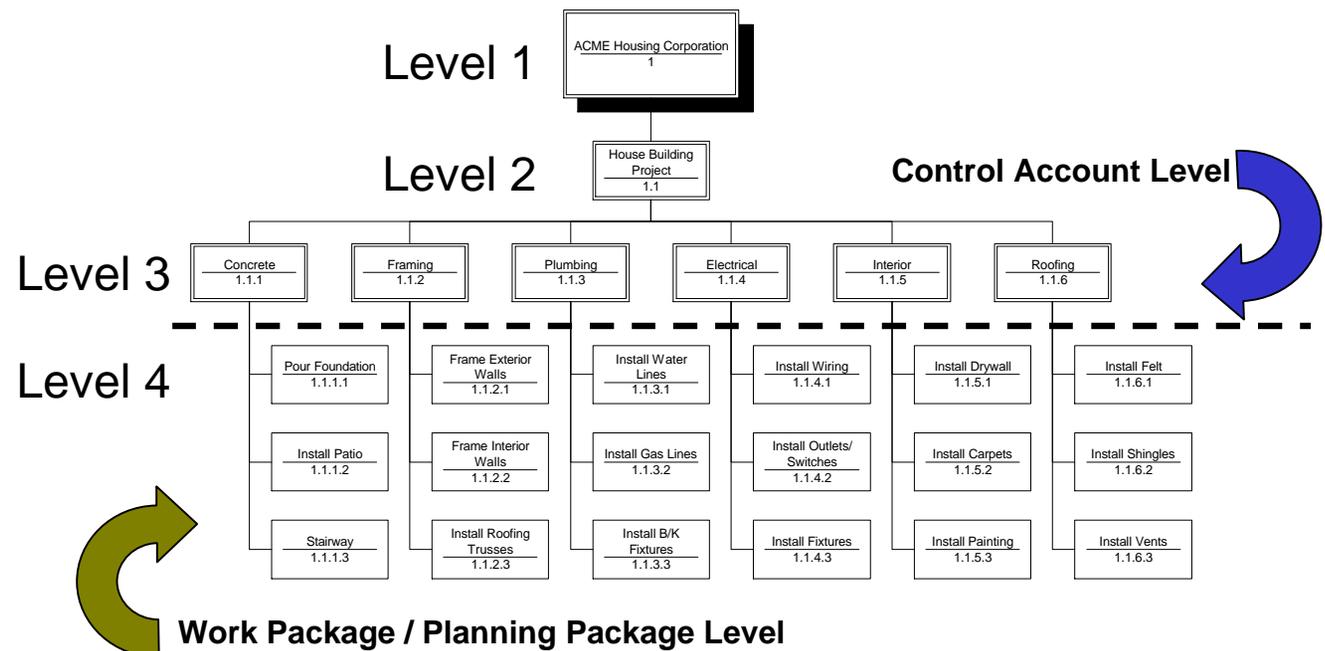


Review of Module 4: Budgeting

A Control Account is an assigned WBS Level used to monitor the cost and schedule performance of a significant element of the work.

Work Packages (WP) contain a discrete segment of work below the Control Account level and provide detailed planning for accomplishing the work within a Control Account.

Planning Packages include efforts that will eventually be identified as separate work packages within the control account. They represent far term efforts that cannot be defined in detail at the start of the control account.



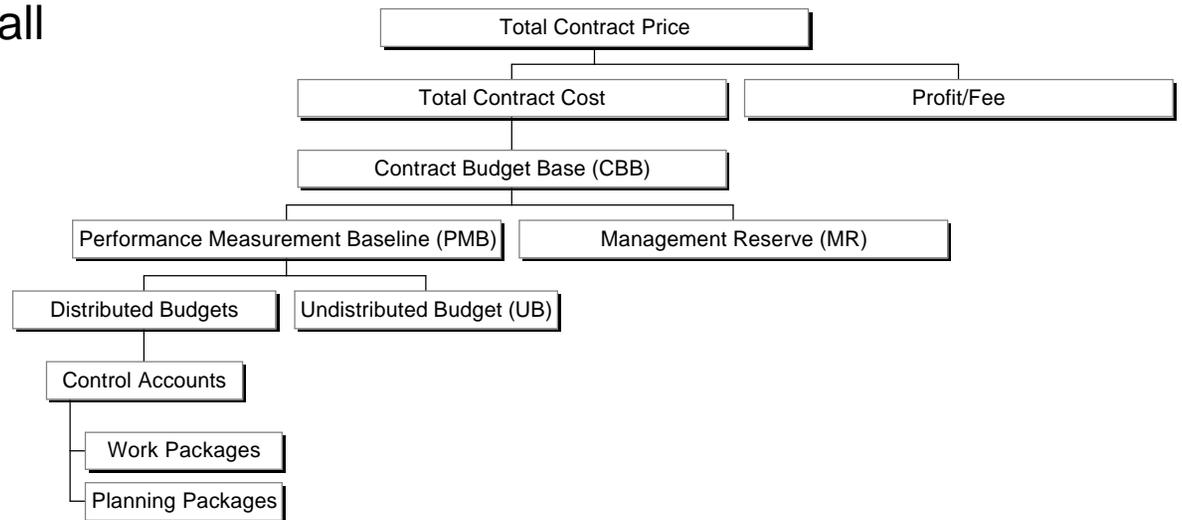


Review of Module 4: Budgeting

The major elements of an earned value contract consist of:

Contract Budget Base (CBB): The total budget, exclusive of fee, for all authorized work

Performance Measurement Baseline (PMB): The time-phased sum of all the allocated budgets



Management Reserve: The amount of the contract budget withheld by Management

Undistributed Budget: Contractually authorized funds not yet allocated to WBS elements.



Review of Module 4: Budgeting

At this point we have examined the basics of planning, scheduling, and budgeting to establish the integrated baseline. These items lay the groundwork for maintaining an Earned Value Management System (EVMS). The next module takes us into the details of Earned Value.

If you have a firm grasp of the concepts covered in these first four modules, feel free to progress to the next module. Otherwise, review the modules to ensure you have a solid understanding of the basics.

This concludes Module 4.